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Pneumatic Tires

CLAIM(S)

An pneumatic tire characterized in that its tread surface has in its width direction notches that would be virtually parallel to the tire's ground contacting front end line when the tire filled with normal inner pressure is contacted with the ground under the tire's maximum load.

DETAILED DESCRIPTION OF THE INVENTION

(Field of Industrial Application)

The present invention pertains to a pneumatic tire having abrasion-resistant treads.

(Prior Art)

As the prior art tire that is improved in abrasion-resistance while maintaining controllability and drivability, there is one, for example, in which multiple shallow notches 3 crossing with the tire rotating shaft at a

specific angle θ are made at equidistance in ribs 2 separated by groove 1. Fig. 2 shows the front part of its ground-contacting surface in the advancing direction. However, when this tire is mounted on the driving wheel of a vehicle and driven, as shown in Fig. 2, the ground-contacting front end line 4 and the notches 3 take nearly parallel positions in the left region L of the ground-contacting front end line 4 when the tread surface of the tire is contacted with the ground, whereas in the right region R of said ground-contacting front end line 4, the ground contacting front end line 4 and the notches 3 cross with each other. Accordingly, in the left region L wherein the ground-contacting front end line 4 and the notches 3 cross with each other, as shown in Fig. 3 (a) indicating the cross-sectional view of A – A', the notches 3 are opened to reduce a shear force working in the tire rotation direction (shown by the arrow), so the abrasion is reduced. By contrast, in the right region R of the ground-contact front end line 4, wherein said notches 3 cross with the ground-contacting front end line, a shear force working in the tire rotation direction (shown by the arrow) cannot be reduced, so the treading side of the notches 3 is abraded and abrasion opposite to the form of heel and toe abrasion is generated, as is evident from Fig. 3 (b) indicating the cross-sectional view of B – B'.

(Problems of the Prior Art to Be Addressed)

The present invention attempts to present a tire, wherein multiple thin notches are made in the tread surface of the tire for improving the drivability and deceleration of the tire.

(Means to solve the Problems)

An pneumatic tire of the present invention is characterized in that its tread surface has in its width direction notches that would be virtually parallel to the tire's ground contacting front end line when the tire filled with normal inner pressure is contacted with the ground under the tire's maximum load.

In this context, said ground-contacting front end line refers to the ground-contacting end line of the tire's ground contacting surface in the advancing direction in the tire's ground contacting condition, in which the tire filled with the respective normal inner pressure for the tire has the maximum load defined by the JATMA and TRA rules. The curvature radius of the ground-contacting front end line can be approximated with the tires having a 90 or higher flattening ratio: tire radius/2.

Fig. 1 shows a partial planar view of one example of the tread pattern of the tire of the present invention. With the example shown in this figure,

multiple shallow notches 3 are made in the entire tread sections crossing with the tire circumferential direction. They are made in parallel to each other at equidistance and actually in parallel to the ground contacting front end line 4 of the tire.

The notches positioned virtually in parallel to said ground contacting front end line 4 virtually do not cross with the ground contacting front end line 4 in the right and left regions of the tire's center line E – E', therefore, do not form the indentations of heel and toe and can prevent the deflected abrasion.

These notches can be made not only in the tire having a tread pattern with ribs 2 formed in the treading surface in the circumferential direction but the notches 3 virtually parallel to the ground contacting front end line can also be made in the tread surface having a tread pattern with multiple blocks 8 formed on the tread surface at equidistance crossing with the tire's circumferential direction.

In this context, "virtually parallel to the ground contacting front end line" means that the notches 3 crossing with tire's circumferential direction are preferably made in the surface of said ribs 2 or blocks 8 in parallel to the ground contacting front end line and that the planar shape of the notches 3 relative to the tread surface is changed in the range in which said notches 3

can reduce, by their deformations, the shear force working on the tire rotation direction when said notches 3 contact with the ground.

The multiple shallow notches need not necessarily be made at equidistance as long as their planar surfaces are virtually parallel to the ground contacting front end line, nor should they have an equal distance from the center line of the tire in the right and left regions of the tire center line, as shown in Fig. 1 and Fig. 4.

The width, depth, and pitch of the notches in the tread section of the tire of the present invention can be properly selected out of those generally used for tires. For example, the groove width is selected within the range of 0.1 – 1.0 mm and the main groove depth within the range of 50% - 100%.

(Embodiment Example)

The present invention is explained below in more detail with reference to the embodiment example.

(Embodiment Example vs. Prior Art Example)

The tire of the present invention (shown in Fig. 1) that has a tread pattern, wherein a shallow bow-shaped notch 2 with width 0.5 mm and depth 12 mm is positioned at equidistance at pitch 10 mm by curvature radius R = 250 mm, and the prior art tire (shown in Fig. 2) having a tread pattern, wherein a linear shallow notch with the same size as that of the

present invention is positioned at equal pitch as in the tire of the present invention by 20° angle were prepared (Both tires have 10.00R20 in size).

These tires were mounted on the driving wheels of the vehicles, and the indentation of the heel and toe (t in Fig. 3 (b); the smaller this value is, the better the performance is.) was measured. The result is shown by an index in the table below.

Table

		Heel and toe indentation (index)
The prior art tire	The region wherein the notch and the ground contacting front end line are parallel.	45
	The region wherein the notch crosses with ground contacting front end line.	100
The tire of the present invention		35

As is evident from the table, the tire of the present invention has a smaller indentation of heel and toe than the prior art tire, and the deflected abrasion is hardly observed in the tire of the present invention.

(Advantage)

According to the present invention, deflected abrasion and abrasion of the heel and toe can be reduced while preserving drivability and

deceleration, which are the characteristics of the tire having a number of shallow notches in the tread surface.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a partial planar view of the tread pattern as one example of the present invention. Fig. 2 shows a partial planar view of the ground contacting surface in the advancing direction when the tire having the prior art tread pattern is contacting with the ground. Fig. 3 (a) and Fig. 3 (b) show the sectional views of A – A' and B – B' lines in Fig. 2, respectively. Fig. 4 shows a partial planar view of another example of the tread pattern of the tire of the present invention.

3. Shallow notch

4. Ground contacting front end line

Translations
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